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THE *POLITUM* GROUP (BULBATE SPECIES) OF *LEIOBUNUM* (ARACHNIDA: PHALANGIDA: PHALANGIIDAE) OF NORTH AMERICA[1]

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ABSTRACT

The genus *Leiobunum* (Arachnida: Phalangida) contains several rather well defined species groups which until now have not been treated as such. The primary characteristic used as a basis for a taxonomic revision of the genus is the morphology of the male intromittent organ. Secondary characteristics include male pedipalps, genital operculum and other body features. This paper describes the "Bulbate Species" of *Leiobunum* which contains only the "*Politum* Group." It includes descriptions of *L. politum* Weed, *L. bracchiolum*, sp. nov., and *L. holtae*, sp. nov. Consideration is also given to the possible phylogenetic relationships of these species.

INTRODUCTION

A recent study of the North American genus *Leiobunum* utilizing both museum specimens and specimens collected from numerous sites throughout the middle and southern portions of the Appalachian Mountains has resulted in the recognition of several rather distinct species groups. The recognition of these groups is considered to be important since it offers a somewhat different approach to the problems of taxonomy encountered by those interested in the species of the genus. Redescriptions and more detailed illustrations are included to clarify and perhaps better delineate the nature of previously described species. Several new species have been described and included in the groups.

The morphology of the male intromittent organ is utilized as a primary taxonomic character in defining species and establishing species groups. The male pedipalps and male and female dorsum and ventrum are considered to be important secondary characters. An attempt has been made to demonstrate, through the use of these characters, possible phyletic affinities between the species of each group, and perhaps, although speculatively, to gain some insight toward the recognition of an evolutionary trend within the genus.

This paper deals with the proposed "*Politum* Group" of the "Bulbate Species" of *Leiobunum*. The term "politum" was selected as the group name because *L. politum* Weed is its oldest recognized species. The term "bulbate" refers to the common structural feature of having a closed thin walled, bulb-like development near the distal end of the penial shaft of each species. Additional groups now being studied and to be described in future papers will include the "*Vittatum* Group," "*Calcar* Group" and one or more groups of "Sacculate Species."

Three species are, thusfar, placed in the *politum* group. *Leiobunum politum* Weed, 1889 is a well known and widely distributed species which is redescribed and illustrated. The remaining species, *L. holtae* and *L. bracchiolum*, are new and described for the first

time. The study, along with the work of Roewer (1923), Davis (1934), Bishop (1949) and Edgar (1966, and 1972), is an attempt to further clarify the systematics of *Leiobunum* and to, hopefully, provide a new approach to an understanding of its species.

[1] Taken in part from a Ph.D. dissertation on the systematics of *Leiobunum* completed at Virginia Polytechnic Institute & State University, Blacksburg, Virginia.

DIAGNOSIS OF BULBATE SPECIES

Penial shaft with either a double or single thin walled, membranous, bulb-like structure which has no apparent openings, using ordinary light microscope technique, to the exterior: bulbus may be located either ventrally, ventrolaterally or laterally toward the distal end of the shaft.

KEY TO THE *POLITUM* GROUP

1a. Penial bulb double, located laterally or ventrolaterally along the distal end of the shaft; may or may not protrude beyond the lateral margin of the shaft (Figs. 1-4); penis length less than 5.0 mm 2

1b. Penial bulb single, located on ventral side of shaft; may lie close to the shaft wall and be rather inconspicuous; penial shaft very long and slender and laterally flattened along approximately the distal one-half (Figs. 5-6); penis length 6.0-7.0mm; G. O. length 2.0-3.0mm male and female . . . . . .*L. holtae* 42

2a(1a). Penial bulb rather large, conspicuous and extending slightly beyond the edge of the shaft when viewed from the dorsal or ventral side; (Figs. 3-4); penis length 2.5-4.0mm; G. O. length 1.2-1.8mm males and females . . . . . *L. politum* 50

2b. Penial bulb not as conspicuous, relatively narrow and almost flush with the lateral edge of the shaft when viewed from the dorsal or ventral side (Figs. 1-2); penis length 1.5-2.5mm; G. O. length 0.9-1.2mm males and females . . . *L. bracchiolum* 71

Leiobunum politum Weed, 1889

Liobunum politus Weed, 1889, p. 89; 1890a, p. 918.
Liobunum politum Weed, 1893c, p. 294.
Liobunum politum and *p. magnum* Weed, 1893d, p. 428-429.
Liobunum politum Weed, 1893a, p. 540; 1893b, p. 548.
Liobunum politum, Banks, 1893, p. 211; 1900, p. 541; 1901, p. 676.
Liobunum politum politum and *p. magnum*, Roewer, 1910, p. 219-220.
Leiobunum politum, Comstock, 1912, p. 75.
Leiobunum politum politum and *p. magnum*, Roewer, 1923, p. 899-900.
Leiobunum politum, Crosby and Bishop, 1924, p. 14.
Leiobunum politum politum and *p. magnum*, Davis, 1934, p. 686-687.
Leiobunum politum, Bishop, 1949, p. 201.
Leiobunum cavernarum Roewer, 1952, p. 270. NEW SYNONOMY
Leiobunum politum, Levi and Levi, 1952, p. 163-167.
Leiobunum politum, Edgar, 1962, p. 146; 1966, p. 363; 1971, p. 1-64.

Diagnosis.—Medium size phalangids, males 3.5 mm to 5.0 mm total length; females 4.5 mm to 6.5 mm total length; genital operculum greater than 1.2 mm in length; penis

greater than 2.5 mm in length; penis with a double ventrolateral bulbus near the distal end of the shaft which protrudes beyond the shafts lateral side; pedipalpal segments armed with a few small spines.

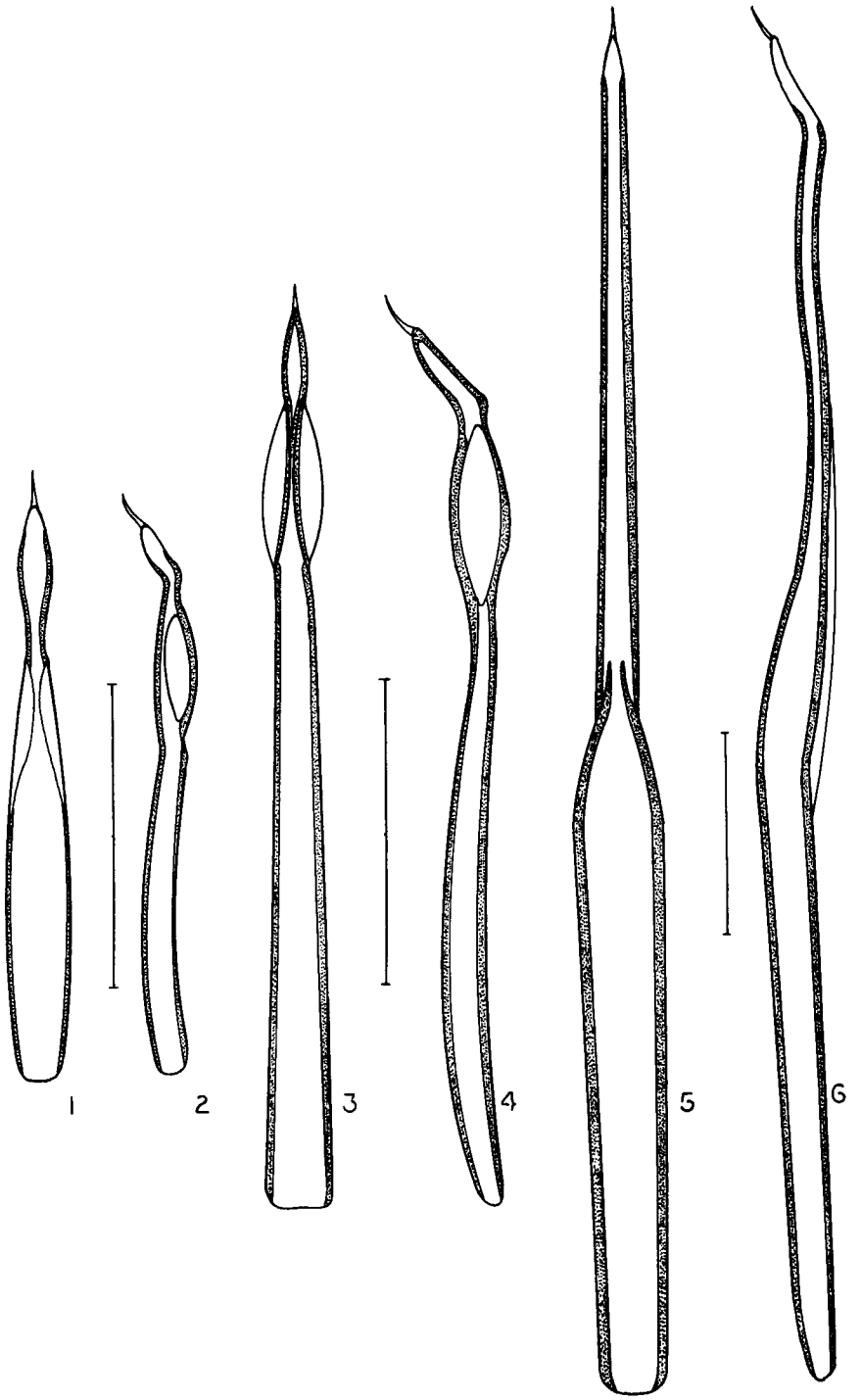
Type specimens.–No type specimens are known for this species. Clarence Weed (1889 p. 90) lists Champaign Co., Illinois as the type locality. Weed's descriptions and illustrations (1893b, plate LXI, and 1893d, plate 15) define the basic features of the species well enough that there is no question of its identity.

Description (Male).–The penis (Figs. 3, 4) has a double ventrolateral bulbus near the distal end which does not open to the exterior. The bulbus is conspicuous and projects slightly beyond the lateral edge of the shaft from a dorsal or ventral view. The total length of the penis varies from about 2.5 mm to 5.0 mm. The pedipalpal femur (Fig. 13) usually has a short row of spines anteroproximally and around the distal end, the patella has spines posteroproximally and the tibia is usually without spines, although, some specimens may have a few small scattered spines. Tarsal spines are small and inconspicuous. The carapace and abdomen (Figs. 7, 9) may be yellow-white or yellow-red in color with a dark brown or black ocular tubercle which is armed with two rows of small sharp spines. There are no prominent dorsal markings in the males. The ventrum (Fig. 11) is pale yellow-white or yellow-red and the genital opercular denticles are usually poorly developed or absent.

Description (Female).–The carapace and abdomen (Figs. 8, 10) may be yellow-white to yellow-red in color with a dark brown or black ocular tubercle armed with two rows of small sharp spines. A large light or dark yellow-brown or brown central mark is usually present on the abdominal tergites and may extend across the postocular ridges onto the carapace. This mark is variable and may be absent in some specimens. The ventrum (Fig. 12) is of the same general coloration and the condition of genital opercular denticles is similar to the male. The pedipalpal femur has spines anteroproximally, anteroventrally and around the distal end, the patella has spines dorsally, anteriorly and posteriorly. The tibia and tarsus are without spines.

Distribution.–This species has a wide distribution (Fig. 28) in the eastern half of the United States. Specimens have been examined from northern Michigan southward to northern Florida. It has been reported from parts of Canada (Edgar, 1966; Bishop, 1949), but the total northern extension of its range is not well known. Some museum specimens labeled *L. politum* from New York, New Hampshire and Maine belong to *L. bracchiolum.* Further investigation of the northeastern range of *L. politum* needs to be conducted. The species extends into Mississippi and Louisiana, has a known westward extension of eastern Arkansas and has been reported from Illinois and Wisconsin by Edgar (1966). It is common in the Appalachian Mountains from Maryland to northern Alabama.

Discussion.–A large number of specimens of this species have been studied from Horse Cove, Graham Co., North Carolina which is the type locality of Roewer's *Leiobunum cavernarum* (1952, p. 270). Weed (1899, p. 89-90) described *L. politum* and presented figures (1893d) of the male dorsum and pedipalp. Weed's diagnosis of *L. politum* is as follows: Body 5.0 mm long, legs 25:51:26:36 mm. Roewer's diagnosis of *L. cavernarum* is as follows: Body 5.5 mm long, legs 27:52:28:38 mm. The differences in size are of little significance since this amount of variation can be found in any population of phalangids. In addition to their similarity in dorsal features and size, the penis which I observed in *L. cavernarum* is the same as that described by Weed (1983d) and illustrated by Davis (1934) and Bishop (1949) for *L. politum.* After having made a careful comparison of the type of *L. cavernarum* with descriptions and other specimens of *L. politum*,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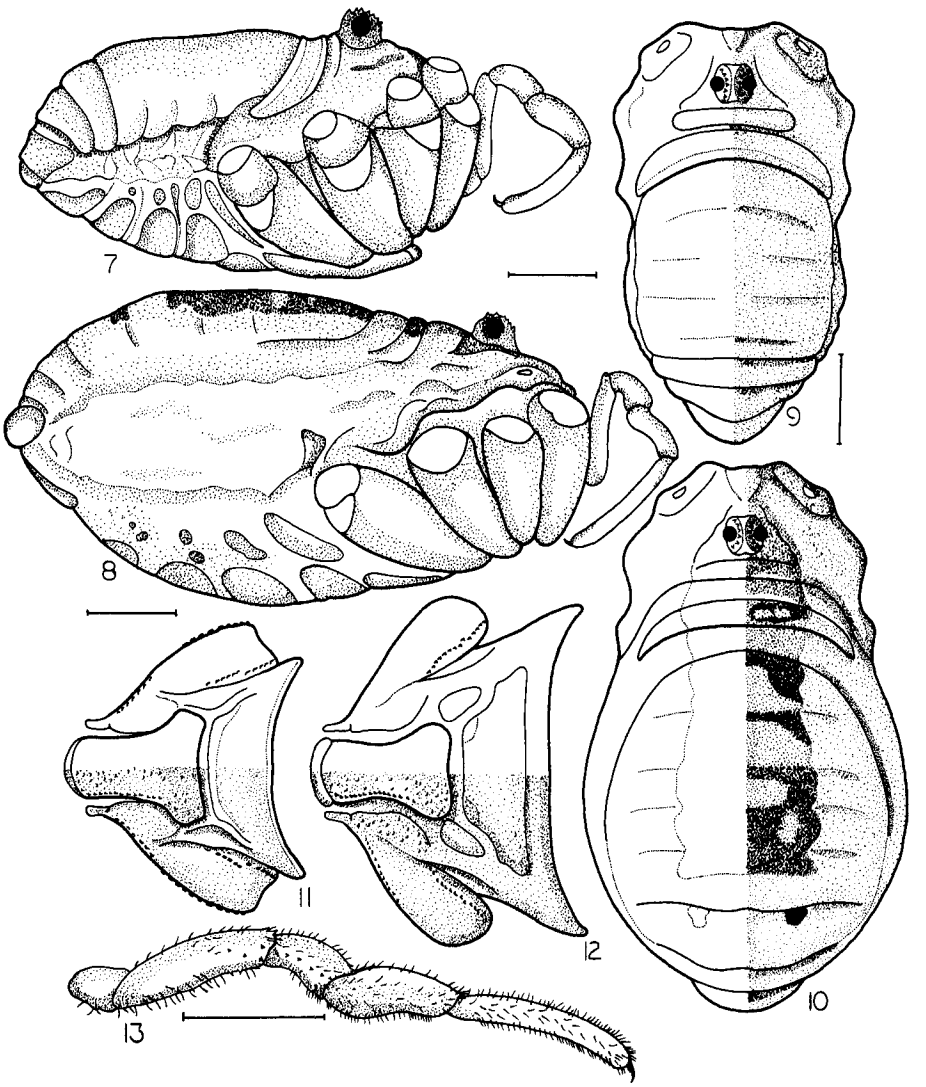


Figs. 7-8.–*L. politum* male and female lateral view.
Figs. 9-10.–*L. politum* male and female dorsum.
Figs. 11-12.–*L. politum* male and female genital operculum.
Fig. 13.–*L. politum* male pedipalp posterior (lateral) view.

including those from Horse Cove, North Carolina, there is little doubt that it is a synonym of *L. politum.*

Leiobunum bracchiolum, new species

Diagnosis.–Small phalangids, 2.0 mm to 3.5 mm total length in males, 3.5 mm to 5.5 mm total length in females; genital operculum less than 1.3 mm in length; penis less than

Figs. 1-2.–*L. bracchiolum* penis dorsal and lateral view.
Figs. 3-4.–*L. politum* penis dorsal and lateral view.
Figs. 5-6.–*L. holtae* penis dorsal and lateral view.

2.5 mm in length; penis with double ventrolateral bulbus elongated along but not protruding noticeably beyond lateral edge of shaft; palpal tibia inflated, larger than other palpal segments, usually white or yellow-white; palpal segments very sparsely armed with spines.

Type specimens.–Male holotype, female allotype and male and female paratypes are in the collection of the American Museum of Natural History. Several paratypes are in the collection of the author at Middle Tennessee State University, Murfreesboro, Tennessee.

Type locality.–Crow's Nest Lodge, Frederick Co., Maryland; near Thurmont, Maryland, 10 August 1967.

Etymology.–The latin word "*bracchiolum*" means "dainty arm." This was selected as the species name because of the small size and absence of all but a few inconspicuous spines on the male pedipalp. The name is appropriate for this species since such a condition is uncommon among North American species of *Leiobunum.*

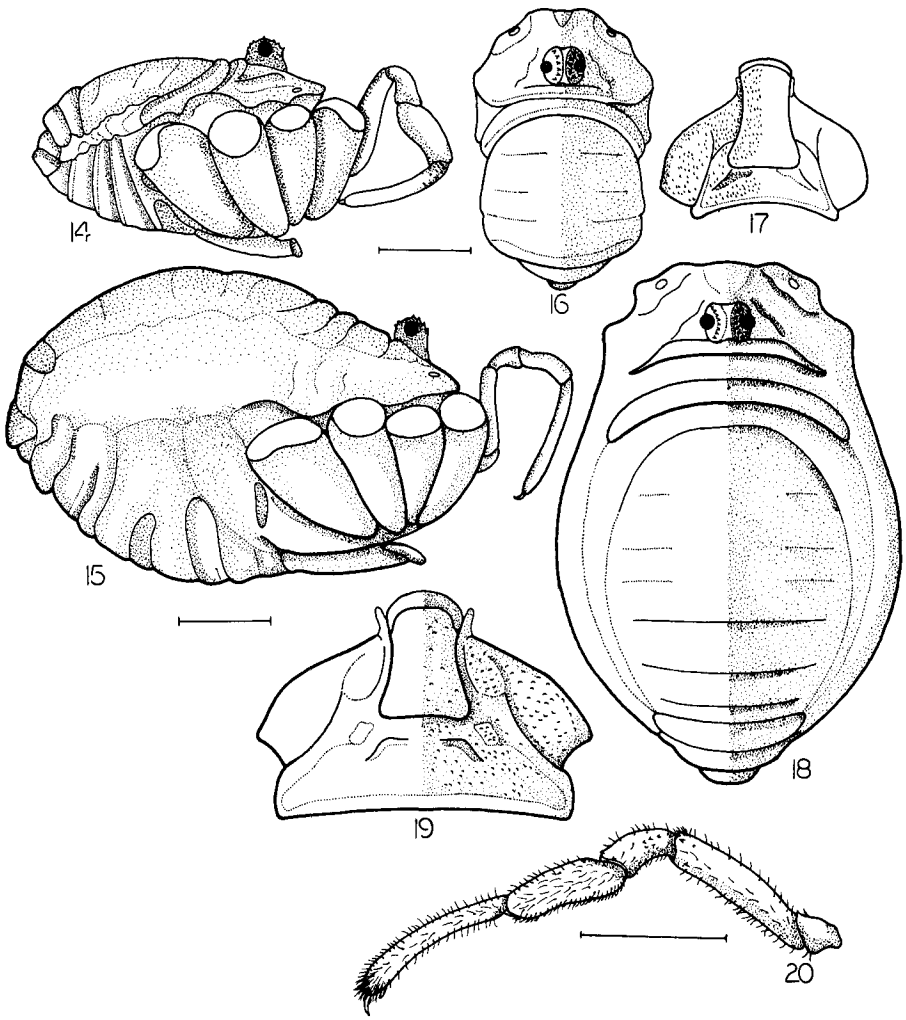
Description (Male).–Penis (Figs. 1, 2) with a double ventrolateral bulbus which is somewhat elongated and not protruding noticeably beyond the lateral edge of the shaft. The penial shaft is short and somewhat laterally thickened along the midsection. The pedipalpal femur (Fig. 20) may have a few spines anteroproximally and dorsodistally; the patella a few spines posteriorly, dorsally near the proximal end and dorsodistally. The palpal tibia is without spines and the spines on the palpal tarsus of the male are very small and inconspicuous. The carapace and abdomen (Figs. 14, 16) are yellowish and the ocular tubercle dark brown to black with two rows of well developed sharp pointed spines. No conspicuous markings are present on the dorsum. The ventrum (Fig. 17) is pale white to yellow-white and the denticles on the genital operculum are weakly developed or absent.

Description (Female).–The carapace and abdomen (Figs. 15, 18) are pale yellow to yellow-brown and the ocular tubercle dark brown to black with small sharp pointed spines similar to those of the male. A dorsal central mark on the abdomen varies from well developed to absent and from very light brown to dark brown. The denticles on the genital operculum (Fig. 19) are weakly developed or absent. Ventral coloration is similar to that of the male. The palpal femur has very small spines anteroventrally, posteroventrally and dorsodistally; the patella has small spines anteriorly, dorsally and posteriorly; the patella of some specimens has a small anterodistal apophysis; the tibia has a few small spines anteriorly and the tarsus is without spines.

Distribution.–Specimens of *L. bracchiolum* have been studied from Maine southward to southern Alabama (Fig. 28). The species has been, thusfar, most commonly found in the Appalachians. Several museum collections from northern states which were labeled *L. politum* contained *L. bracchiolum.* It is possible that confusing these two species in the past has led to an overestimation of the range of *L. politum* in the north. The westward extension of *L. bracchiolum* appears now to be the western edge of the Appalachian range. No specimens were found on a recent collecting trip to the Ozark Mountains and Ouachita Mountains of Arkansas.

Disscussion.–*Leiobunum bracchiolum* resembles *L. politum* very closely upon casual observation and has undoubtedly been confused with and described as *L. politum* in the past. The two species are quite distinct in both size and in the structure of the penis (Figs. 1-4) which is the most diagnostic feature in their separation. The structure of the penis, pedipalp and to a lesser degree the body of *L. politum* and *L. bracchiolum* leads to the conclusion that these species are closely related phylogenetically.

The males can be easily distinguished, but the females of these species are much more difficult to separate. In general, the females of *L. politum* are larger and slightly more

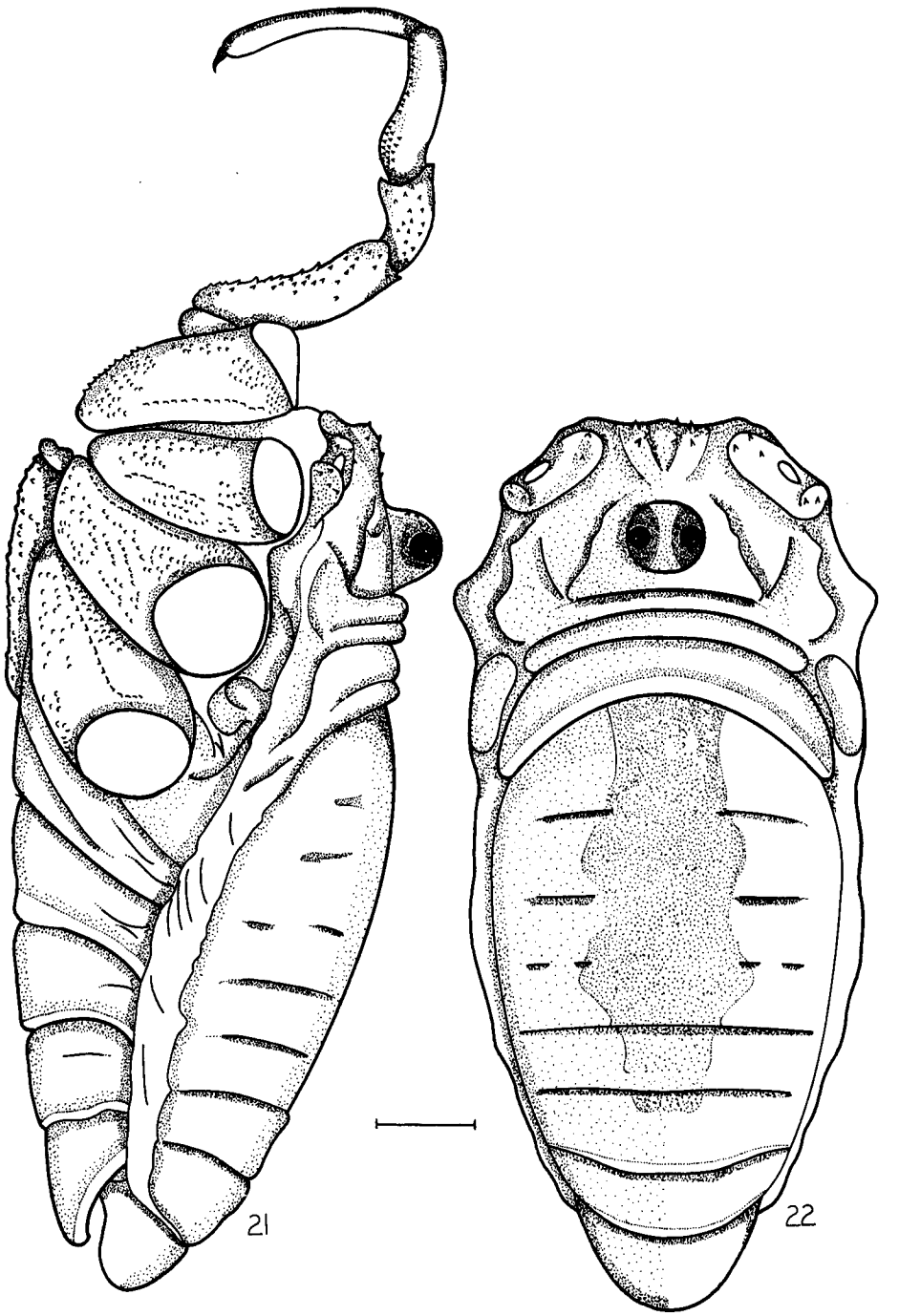


Figs. 14-15.–*L. bracchiolum* male and female lateral view.
Figs. 16-17.–*L. bracchiolum* male dorsum and genital operculum.
Figs. 18-19.–*L. bracchiolum* female dorsum and genital operculum.
Fig. 20.–*L. bracchiolum* male pedipalp posterior (lateral) view.

robust than are the females of *L. bracchiolum.* Females are fairly easily separated in large samples where both species are present. Almost nothing is known of the life cycle of *L. bracchiolum.* Data from collections indicates that it may have a cycle somewhat similar to *L. politum*, but this is speculative. The ranges of the two species overlap and they have, on a number of occasions, been collected from the same habitat.

Leiobunum holtae, new species

Diagnosis.–Large phalangids, males 7.5 mm to 9.0 mm total length; females 10.0 mm to 12.0 mm total length, genital operculum greater than 2.0 mm in length; penis greater than 5.5 mm in length, narrow, laterally compressed distally, dorsoventrally compressed



Figs. 21-22.–*L. holtae* male lateral and dorsal view.

posteriorly; male pedipalps large, robust and heavily armed with spines.

Type specimens.–Male holotype and female allotype and male and female paratypes are in the collection of the American Museum of Natural History. Several paratypes are in the collection of the author at Middle Tennessee State University, Murfreesboro, Tennessee.

Type locality.–Cumberland Mountain State Park, Cumberland Co., Tennessee, 22 June and 17 August, 1967.

Etymology.–It is with pleasure that I give *Leiobunum holtae* to Mrs. Virgie F. Holt, a gracious lady, a good friend and a native of the Tennessee Cumberland Plateau where this species was discovered.

Description (Male).–The penis (Figs. 5, 6) consists of a very long slender shaft, which is posteriorly dorsoventrally compressed and anteriorly laterally compressed. A single, inconspicuous, elongated bulbus extends along the ventral side of the distal end of the shaft. The pedipalpal femur (Fig. 27) is armed with a row of spines posteroventrally and anteroventrally, a few spines dorsally, and a rather large cluster of spines posteroventrally near the distal end. The patella has a row of spines around the distal edge with numerous small spines scattered over all surfaces, except the ventral. The tibia has a row of spines anteroventrally near the distal end, a conspicuous group proximoventrally and a few scattered around the distal end. Spines on the palpal tarsus are large and well developed. The carapace and abdomen (Figs. 21, 22) range from yellowish to reddish or brownish-yellow, and the ocular tubercle is dark brown to black with the mid longitudinal line usually concolorous with the carapace and is armed with only a few (0-3) poorly developed spines which appear as low rounded knobs in most specimens. The dorsal mark is reddish-brown and usually weakly developed on all tergites except I. The ventrum (Fig. 25) is pale brown-yellow with the genital opercular denticles well developed and extending one-half to three-fourths the length of the operculum. The operculum has a heavily chitinized lip which, in most specimens, is distinctly grooved, a feature which has not been observed in other species of *Leiobunum.*

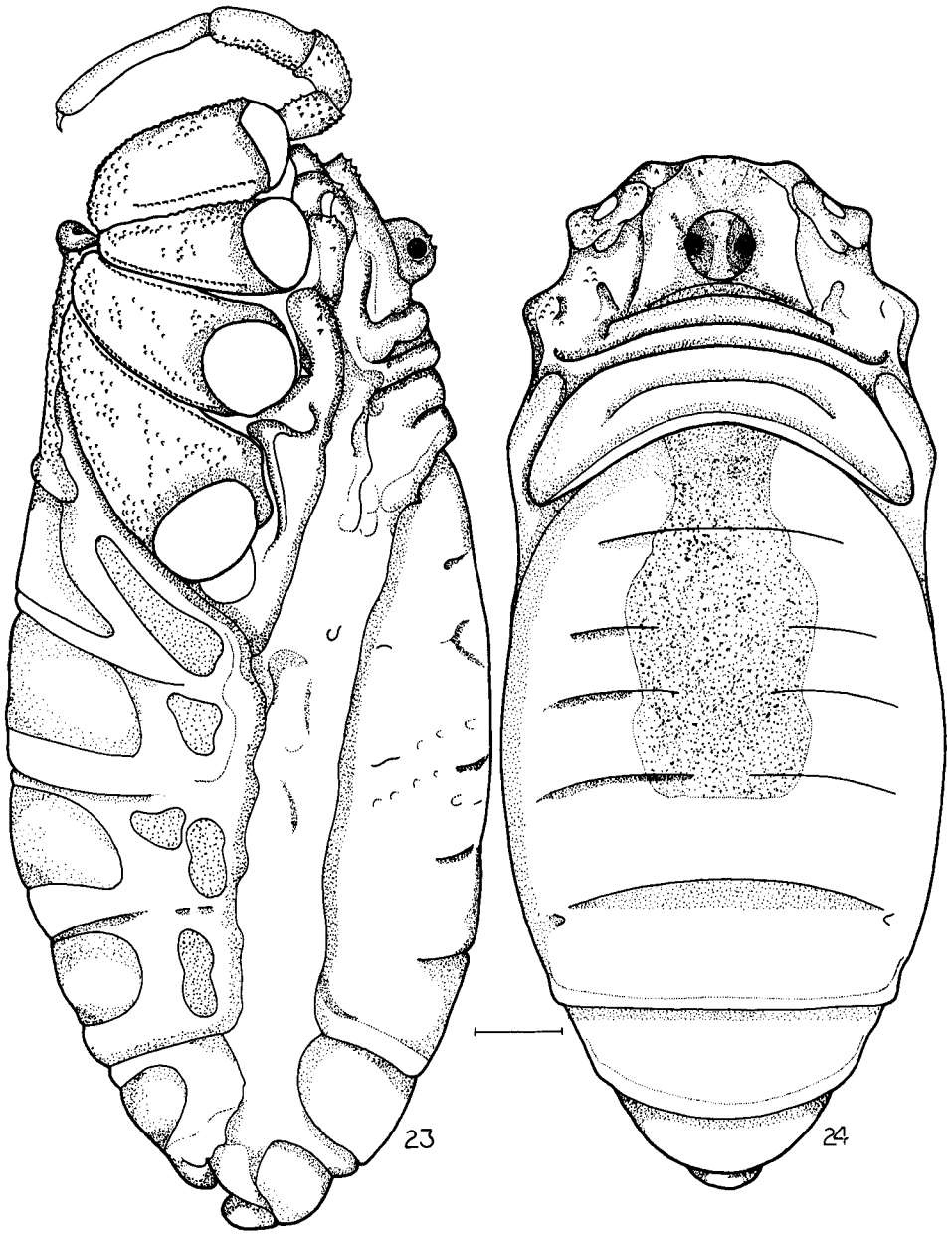
Description (Female).–The females (Figs. 23, 24) of this species are perhaps the largest of the North American phalangids. They have about the same general coloration and marking as the males and can be easily identified as *L. holtae* when males are collected with them. Their spination and development of genital opercular denticles (Fig. 26) is also similar to that of the males. The lip of the operculum is more heavily chitinized and deeply grooved than the male structure.

Distribution.–*Leiobunum holtae* is known from Cumberland, Sequatchie, Van Buren and Grundy Counties in eastern Tennessee and from Clay and Marshall Counties in northeastern Alabama (Fig. 28). Its distribution, thusfar, includes only the southern portion of the Cumberland Plateau.

Discussion.–This is an interesting species in many respects. Nothing is known of its life cycle, however, mature adults have been collected from early spring to late fall. This is rather unusual since most *Leiobunum* species in the eastern United States appear to have their adult stages prevalent either in the spring or fall months, but not both. Collecting data gathered so far from numerous sites throughout the southeastern states and northward to Maryland indicates that *L. holtae* occupies a rather narrow range in the southern Appalachian region. It is very common, however, in areas where it is found. The structure of the penis is also very different from any observed in other species of the genus. Although, it has been placed with the *politum* group because of the presence of the bulbus, it is significantly different from both *L. politum* and *L. bracchiolum* and could be

considered a distinct group in view of the differences discussed.

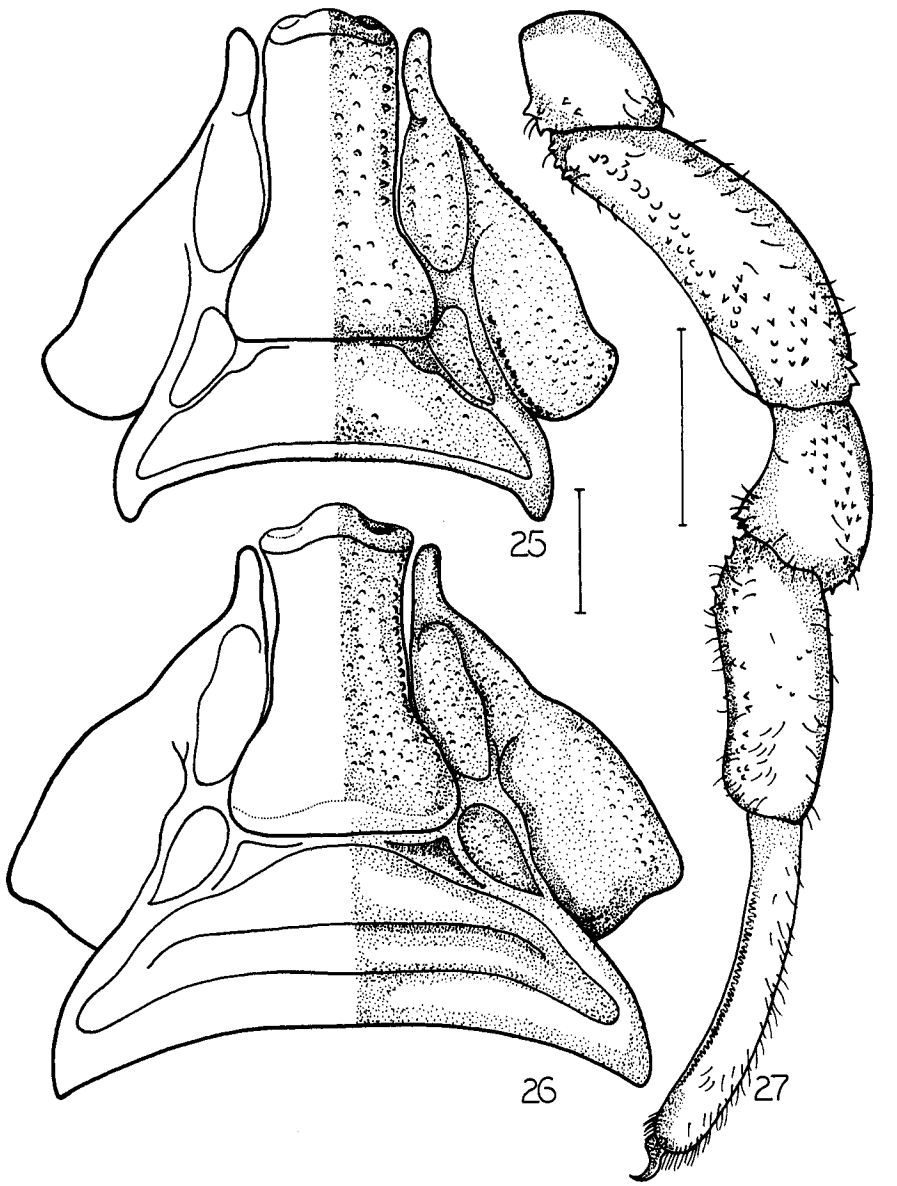
Phylogenetic considerations.—The striking morphological similarity in penial, pedipalpal and general body features between *L. politum* and *L. bracchiolum* is regarded as a valid argument for those two species having diverged from a close phyletic line of descent. *Leiobunum politum* may be considered to be the more primitive of the two if reduced size, reduced sclerotization, reduced spination, a reduction in degree of body segmentation and a generally more fragile structure of appendages such as found in *L. bracchiolum*



Figs. 23-24.—*L. holtae* female lateral and dorsal view.

is considered to be an advanced evolutionary condition. The double bulbus on the penial shaft is the strongest argument for close affinities between these species.

Leiobunum holtae is quite different morphologically from *L. politum* and *L. brachiolum*. The penis has a distinctly different structure, the pedipalps are much more heavily sclerotized and bear numerous large spines, the body is heavily sclerotized and larger than any other known species of phalangid in North America. The bulbus on the *L.*



Figs. 25-26.–*L. holtae* male and female genital operculum.
Fig. 27.–*L. holtae* male pedipalp posterior (lateral) view.

holtae penis is interpreted as being of an evolutionary line related to the *politum-bracchiolum* line, but the single nature of the bulbus and the completely different structure of the penial shaft indicates a divergence far removed from the double bulbus condition of *L. politum* and *L. bracchiolum*. There is little reason to doubt the close and probably relatively recent divergence of *L. bracchiolum* from *L. politum* or a similar ancestor, however, *L. holtae*'s affinities within this group are less clear and the question as to how it should be grouped with the other two is open. Collection data so far suggests that *L. holtae* may well be a relict species surviving only in the more remote areas of the Cumberland Plateau region of Tennessee and Alabama.

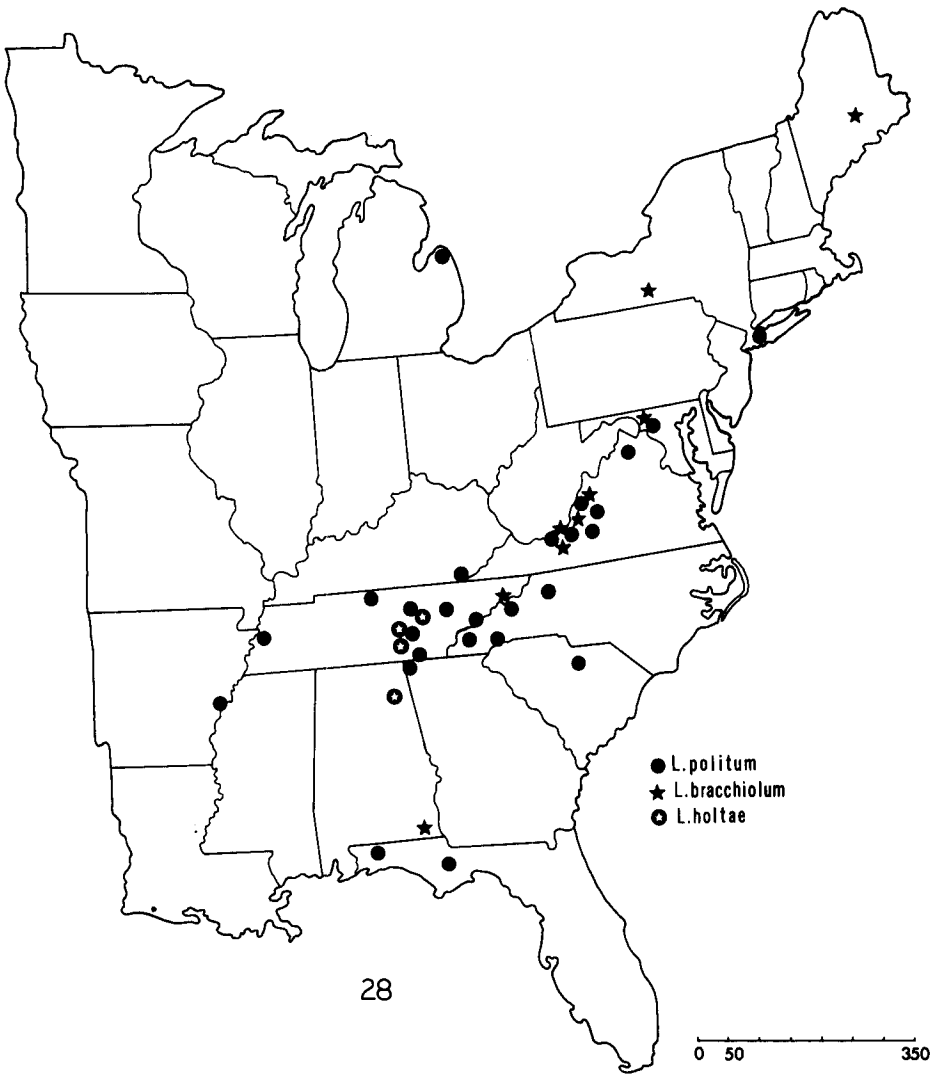


Fig. 28.—Distribution of *L. politum*, *L. bracchiolum* and *L. holtae* in the eastern United States.

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LITERATURE CITED

Banks, N. 1893. The Phalanginae of the United States. Can. Entomol. 25(8):205-211.

Banks, N. 1900. Some Arachnida from Alabama. Acad. Nat. Sci. Philadelphia 52:529-543.

Banks, N. 1901. Synopsis of North American invertebrates. Amer. Nat. 35:669-679.

Bishop, S. C. 1949. The Phalangida (Opiliones) of New York. Rochester Acad. Sci. 9(3):159-235.

Comstock, J. H. 1912. The spider book. Comstock, Ithaca

Crosby, C. R. and S. C. Bishop. 1924. Opiliones of the southeastern United States. Elisha Mitchell Sci. Soc. Jour. 40:13-21.

Davis, N. W. 1934. A revision of the genus *Leiobunum* (Opiliones) of the United States. Amer. Midland Nat. 15(6):662-705.

Edgar, A. L. 1962. A new phalangid (Opiliones) from Michigan, *Leiobunum lineatum* sp. nov. Trans. Amer. Micros. Soc. 81:146-149.

Edgar, A. L. 1966. Phalangida of the Great Lakes region. Amer. Midland Nat. 75(2):347-366.

Edgar, A. L. 1971. Studies on the biology and ecology of Michigan Phalangida (Opiliones). Mus. Zool., Univ. Michigan Misc. Pub. 44:1-64.

Levi, L. R. and H. W. Levi. 1952. Preliminary list of harvestmen of Wisconsin with a key to genera. Trans. Wisc. Acad. Sci. 41:163-167.

Roewer, C. F. 1910. Opiliones Plagiostethi (Opiliones Palpatores). Abhandl. aus dem Gebiete der Natur-wissenschaften, 19(4):1-294.

Roewer, C. F. 1923. Die Weberknechte der Erde. Gustav Fischer, Jena. 1116 pp.

Roewer, C. F. 1952. Einige Phalangiiden aus dem Vereinigten Staaten von Nord-Amerika. Zool. Anz. 149(11/12):267-273.

Weed, C. M. 1889. A descriptive catalogue of the Phalangiinae of Illinois. Bull. Illinois State Lab. Nat. Hist. 3:79-97.

Weed, C. M. 1890. The harvest spiders of North America. Amer. Nat. 24:914-918.

Weed, C. M. 1893a. The Cinnamon harvest-spider and its variations. Amer. Nat. 27:534-541.

Weed, C. M. 1893b. A descriptive catalogue of the harvest-spiders (Phalangiidae) of Ohio. Proc. United States Nat. Mus., 16:543-563.

Weed, C. M. 1893c. Notes on Ohio and other Phalangiidae. Amer. Nat. 27:294-296.

Weed, C. M. 1893d. A preliminary synopsis of the harvest-spiders (Phalangiidae) of Mississippi. Psyche 6(204):425-429.